

measuring a characteristic of the device;
determining the thickness of a phase matching layer needed to maintain the characteristic substantially the same after encapsulation;
depositing the phase matching layer with the desired thickness; and
completing the processing, packaging and encapsulation of the device.

91 3. A method of fabricating an encapsulated VCSEL having a controlled slope efficiency, the method comprising the steps of:
fabricating the initial VCSEL;
measuring the slope efficiency of the VCSEL;
determining the thicknesses of a tuning layer and a phase matching layer calculated to achieve the desired slope efficiency;
depositing the tuning layer and phase matching layer having the determined thicknesses; and
encapsulating the VCSEL.

92 4. (New) The encapsulated optoelectronic device of claim 1 wherein said optoelectronic device comprises:
a substrate;
a first mirror disposed on the substrate;
an optical cavity adjacent the first mirror; and
a second mirror adjacent the optical cavity opposite the first mirror, wherein said phase matching layer is coated on a top surface of said second mirror.

5. (New) The encapsulated optoelectronic device of claim 1 wherein the phase matching layer comprises a non-quarter wavelength layer of optically transparent material deposited over the second mirror.

6. (New) The encapsulated optoelectronic device of claim 5 wherein the optically transparent material comprises silicon oxide.

7. (New) The encapsulated optoelectronic device of claim 5 wherein the optically transparent material comprises a combination of silicon oxide and silicon nitride.

8. (New) The encapsulated optoelectronic device of claim 1 wherein the optoelectronic device comprises a laser that emits light at a wavelength in a range from about 780 nm to about 860 nm.

9. (New) The encapsulated optoelectronic device of claim 1 wherein the optoelectronic device comprises a laser that emits light at a wavelength in a range from about 1200 nm to about 1600 nm.

92 10. (New) The encapsulated optoelectronic device of claim 1 wherein the optoelectronic device comprises a laser that emits light at a wavelength in a range from about 350 nm to about 700 nm.

11. (New) An encapsulated surface emitting laser, comprising:
a substrate;
a first mirror disposed on the substrate;
an optical cavity adjacent the first mirror;
a second mirror having a top facet reflectivity disposed adjacent the optical cavity opposite the first mirror;
a tuning layer for predictably changing the top facet reflectivity by an amount based on values predetermined to adjust slope of the laser to within a desired range; and
a phase matching layer comprised of a dielectric constant similar to the encapsulant, the thickness of the material designed to make the optoelectronic properties of the optoelectronic device the same both pre and post encapsulation.

12. (New) The surface emitting laser of claim 11 wherein the tuning layer comprises a non-quarter wavelength layer of optically transparent material deposited over the second mirror.

13. (New) The surface emitting laser of claim 11 wherein the phase matching layer comprises a non-quarter wavelength layer of optically transparent material deposited over the tuning layer.

14. (New) The surface emitting laser of claim 11 wherein the tuning layer comprises silicon oxide.

15. (New) The surface emitting laser of claim 11 wherein the tuning layer comprises silicon nitride.

02 16. (New) The surface emitting laser of claim 11 wherein the tuning layer comprises a combination of silicon oxide and silicon nitride.

17. (New) The surface emitting laser of claim 11 wherein the phase matching layer comprises silicon oxide.

18. (New) The surface emitting laser of claim 11 wherein the phase matching layer comprises silicon nitride.

19. (New) The surface emitting laser of claim 11 wherein the phase matching layer comprises a combination of silicon oxide and silicon nitride.

20. (New) The surface emitting laser of claim 12 wherein the tuning layer further comprises a distributed Bragg reflector disposed between the second mirror and the optically transparent material.

21. (New) The surface emitting laser of claim 20 wherein the distributed Bragg reflector comprises alternating layers of oxides and nitrides.

22. (New) The surface emitting laser of claim 20 wherein the tuning layer further comprises a layer of optically transparent material phase matched to the upper mirror and disposed between the second mirror and the distributed Bragg reflector.

23. (New) The surface emitting laser of claim 22 wherein the layer of optically transparent material phase matched to the upper mirror comprises a one half wavelength layer of silicon nitride.

92 24. (New) The surface emitting laser of claim 11 wherein the laser emits light at a wavelength in the range from about 780 nm to about 860 nm.

25. (New) The surface emitting laser of claim 11 wherein the laser emits light at a wavelength in the range from about 1200 nm to about 1600 nm.

26. (New) The surface emitting laser of claim 11 wherein the laser emits light at a wavelength in the range from about 350 nm to about 700 nm.

27. (New) An optical subassembly, comprising:
a first plastic housing substantially encapsulating an optical transmitter having a surface coated with a phase matching layer comprised of a dielectric constant similar to the encapsulant, wherein thickness of the phase matching layer designed to make one or more properties of the optical transmitter the same both pre and post encapsulation.

28. (New) The optical subassembly of claim 27 further comprising:
a power monitor having a beam splitter that reflects a first portion of transmitted light onto a detector which produces a feedback signal as a function of said reflected light.

29. (New) The optical subassembly of claim 28 further comprising a second plastic housing coupled to said first plastic housing, said second plastic housing including a ball lens aligned in an optical path carrying a second portion of said transmitted light from the beam splitter into an optical fiber, and a ferrule for aligning the optical fiber in the optical path.

30. (New) The method of claim 2 wherein the measuring step comprises measuring the slope of the initial laser.

31. (New) The method of claim 30 wherein the step of depositing said phase matching layer comprises depositing an optically transparent layer to maintain the slope efficiency substantially the same after encapsulation.

32. (New) The method of claim 2 wherein the encapsulating step comprises encapsulating said optoelectronic device in plastic.

012 33. (New) The method of claim 32 further comprising:
optically aligning a plastic optical subassembly comprising a molded lens and a fiber connector with the encapsulated optoelectronic device; and
coupling the plastic encapsulated optoelectronic device and aligned optical sub assembly.

34. (New) The method of claim 2 wherein the fabricating step comprises the step of fabricating a laser that emits light at a nominal wavelength of about 850 nm.

35. (New) The method of claim 2 wherein the fabricating step comprises the step of fabricating a laser that emits light at a wavelength in a range from about 1200 nm to about 1600 nm.

36. (New) The method of claim 2 wherein the fabricating step comprises the step of fabricating a laser that emits light at a wavelength in a range from about 350 nm to about 700 nm.

37. (New) The method of claim 3 wherein the step of depositing said phase matching layer comprises depositing an optically transparent layer to maintain the slope efficiency substantially the same after encapsulation.

38. (New) The method of claim 3 wherein the fabricating step comprises the steps of disposing first and second mirrors on a substrate defining a laser cavity, and wherein the tuning layer adjusts the slope efficiency of the laser.

39. (New) The method of claim 38 wherein the step of depositing said tuning layer comprises depositing a distributed Bragg reflector over the second mirror to provide a first adjustment of the slope efficiency and then depositing an optically transparent layer for changing phase of surface reflection to provide a second adjustment of the slope efficiency.

40. (New) The method of claim 3 wherein the encapsulating step comprises encapsulating said VCSEL in plastic.

41. (New) The method of claim 40 further comprising:
optically aligning a plastic optical subassembly comprising a molded lens and a fiber connector with the encapsulated VCSEL; and
coupling the plastic encapsulated VCSEL and aligned optical sub assembly.

42. (New) The method of claim 3 wherein the fabricating step comprises the step of fabricating a VCSEL that emits light at a nominal wavelength of about 850 nm.

43. (New) The method of claim 3 wherein the fabricating step comprises the step of fabricating a laser that emits light at a wavelength in a range from about 1200 nm to about 1600 nm.

44. (New) The method of claim 3 wherein the fabricating step comprises the step of fabricating a VCSEL that emits light at a wavelength in a range from about 350 nm to about 700 nm.